IJARCCE

ISSN (Online) 2278-1021
ISSN (Print) 2319-5940

International Journal of Advanced Research in Computer and Communication Engineering

Vol. 9, Issue 2, February 2020

Evaluating the Use of Industrial Internet of Things (IIoT) for Business Models

Dr Mohd Uruj Jaleel[1], Dr Sabeen Fatma[2]

Assistant Professor, College of Computing & Informatics, Saudi Electronic University, Riyadh (KSA)[1]

Department of Bioinformatics, Faculty of Biological Engineering, Shobhit University, Meerut, India[2]

Abstract: The Internet of Things (IoT) is the milestone in the evolution of the internet, as everyday objects are connected to the internet, and obtain the capacity to communicate with other devices and sense their environment. Especially the IIoT is one of the most pivotal about industrial business concepts since the recent years, companies try to focus on business models and operational efficiency. This paper emphasizes on researching the Industrial Internet of Things (IIoT). There is already a lot of information about the common Internet of Things but still a gap in research in the business perspective, especially the concept of business models for the IIoT. The goal of this paper is to investigate different kinds of business models, how they work and how feasible they are. The need to research possible business models for an IIoT framework, as traditional business models are relevant for this study, such as the Business Model Canvas which has been proposed by Alexander Osterwalder or the Business Model Navigator by Oliver Gassmann. But there is still a lack of literature covering the business models for the IIoT. Therefore, after researching the concept of IIoT from a business perspective, we identified fruitful criteria and sustainable business models. With a qualitative literature study, I was able to develop an IIoT business model framework, based on the dynamics and complexity of the IIoT concept, which incorporates business strategies and provides companies with a flexible approach. The business model framework can be used in any business industrial context.

Keywords: Internet of Things (IoT), Industrial Internet of Things (IIoT), Business Models

I. INTRODUCTION

The IoT defines to the interconnection of physical objects, by equipping them with sensors, actuators and a means to connect to the Internet. IoT is a current phenomenon that is estimated to have important effect on not only the business world, but the lives of everyone. Even though, one of the toughest issues that companies developing IoT solutions face lies in choosing the right business model, or the right blend of business models to adopt (De Saulles, 2016).

IoT is a new technology boom that is affecting our lives in a positive way. It is an important phenomenon, which not only has drastic ramifications for the business world, but for everyday life as well. IoT is changing everything, be it driverless cars, smart refrigerators, patient monitoring systems or industrial automation (Gasiorowski-Denis, 2016).

1.1 Definition of Internet of Things (IoT)

Internet of Things is a concept that encompasses various objects and methods of communication to exchange information. Today IoT is more a descriptive term of a vision that everything should be connected to the internet. IoT will be fundamental in the future because the concept opens up opportunities for new services and new innovations. All objects will be connected and able to communicate with each other, while they operate in unprotected environments. It describes how this technology should be implemented and how IoT devices interact with each other in a secure manner (Burgess, 2018).

1.2 Definition of Industrial Internet of Things (IIoT)

IIoT (Industrial Internet of Things) is a concept based on the same principles as the IoT, but for the connection of machines in a factory. This communication is primarily between machines and autonomous action based on the information exchanged with each other (Gilchrist, 2016). A layer of high availability software is an important role in this type of communication. With it, the possibility to use the Internet of Things in all industries is guaranteed. So, this means that the network system to work with other systems to provide information is allowed. For example, with that information via the network some employees can be informed about problems and react quickly. The more and more data industries are connected online, software will be able to be used to optimize everything.

1.3 Difference between IoT and IIoT

The IoT and IIoT can be differed by some parameters, such as security. The security is critical for all IoT solutions, but industrial IoT solutions require more robust measures. A disruption of a high-volume manufacturing process results in

lost production costing millions of dollars per day. A takedown of the electrical grid affects economic activity for millions of people and jeopardizes national security.
IIoT solutions employ a variety of advanced security measures, from secure and resilient system architectures, specialized chipsets, encryption and authentication, threat detection, to management processes.
Furthermore, industrial operations require higher levels of precision and accuracy. Automated high-volume, high speed manufacturing processes are synchronized to milliseconds. Quality assurance systems detect minute variations and take immediate corrective actions based on those measurements. In this environment, "close enough" is not good enough, and results in lost efficiency, downtime, and revenues. The industrial IoT solutions must support operations where high precision and accuracy are "business as usual".

IIoT solutions must co-exist in an environment with a significant amount of legacy operations technologies (OT), including SCADA, M2M, and other purpose-built manufacturing execution systems. Also, the IIoT solutions must integrate, support various protocols and data sets, and work reliably with these manufacturing systems (Serpanos et al., 2017).

Industrial networks are specialized large-scale networks supporting ens of thousands of controllers, robots and machinery or other purpose-built applications. IIoT solutions deployed into these networks must scale seamlessly, now and later, to support tens of thousands of new sensors, devices, as well as existing non-IoT devices. The support also includes interoperability, scheduling, workflow integration, data collection, analysis, and integration with manufacturing and business execution systems.

Industrial systems operate in long time scales before replacement. They are operating in harsh environments, sometimes subject to extreme heat, cold, high vibration, pressure, and dust conditions. They may operate in remote locations, that can be far away from the headquarters. The IIoT solutions may be subject to the same conditions and requirements. They must be hardened to support high availability, withstand high duty cycles, and operate reliably and within the tolerance, every day for years (Chan, 2017).

The industrial systems must operate reliably and predictably in harsh conditions for years and years. Supporting this level of performance required regular maintenance from in-house and field service technicians. IoT solutions operating in industrial environments must be serviceable in order to sustain the levels of performance required. From swapping out sensors, updating firmware, to configuring gateways and servers, the ability to maintain industrial IoT solutions over its entire lifecycle is an essential requirement (CTI Group, 2016).

II. BUSINESS MODELING

A lot of companies develop excellent and technological products, but many of them are suddenly losing their competitive advantage. Some examples are Nokia, Motorola, Triumph, American Airline and many more. These tragic consequences are occurring because these companies failed to adjust their business models to the changing environment around them. It is not enough to develop a sophisticated product, over the years the environment keeps changing and the business of a company needs to change with it. Otherwise it can't keep up with its competitors and remain to fall by the wayside. Today the success of a company depends on its ability to create an innovative business model. There are very few firms that are outstanding, & which have actually managed to do so successfully (Emerald, 2015).

Your business model is the formula that allows you to make money, it is simply *how* you plan to make money. It is a combination of how you provide your customers with value and make a profit doing so. The more differentiated and proprietary your combination is, the more profitable you'll be. Differentiated business models offer customers products, services, or other value that stands out from the competition. Furthermore, your business model should be difficult to copy. A proprietary business model is a differentiated model that's difficult or impossible for a competitor to emulate (Gassmann et al., 2014). Proprietary models create methods to deliver products and services better, cheaper, or faster through a business process known only to that company. Also, create a closed ecosystem where ongoing use of your product is highly-desirable or required. Do business in a way competitors thought was unprofitable or impractical.

2.1 Core of Business Models (Magic Triangle)

To explain the expression of a business model, I refer to the form of the 'magic triangle' to show the four dimensions (Gassmann et al., 2014).

IJARCCE

ISSN (Online) 2278-1021
ISSN (Print) 2319-5940

International Journal of Advanced Research in Computer and Communication Engineering

Vol. 9, Issue 2, February 2020

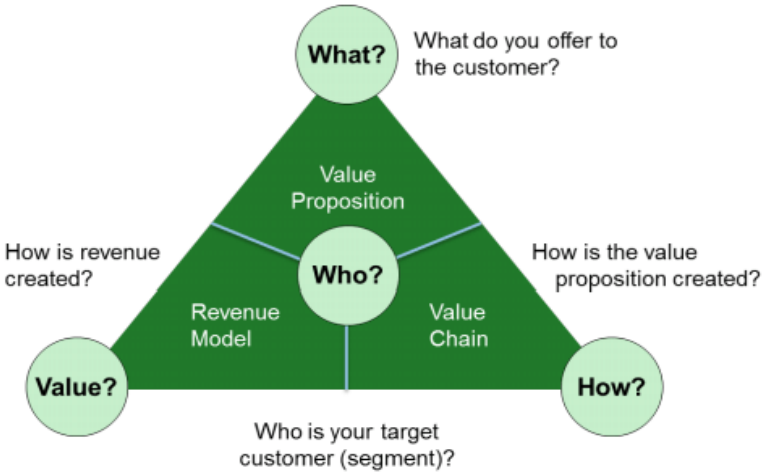

Fig.1 Magic Triangle

The customer – **who** are our target customer?

The focus here is to understand which customer segments are relevant for the business and which ones aren't because those are not going to be addressed with your business model. Customers are the most important part of every business models, without any exceptions.

The value proposition – **what** do we offer to customers?

This dimension defines and displays the offerings of the company. So, in this section the products or services are described and how you are going to serve them for your target customers' needs.

The value chain – **how** do we produce our offerings?

This regards the explanation on the various processes and activities you need in order to put your value propositions into effect.

The profit mechanism – **why** does it generate profit?

To find out what makes a business model financially viable, aspects such as cost structures and revenue-generating mechanisms need to be analyzed. This provides an answer to the question on how the company produces value for their shareholders and stakeholders (Gassmann et al., 2014).

2.2 Challenges of the business model innovation

2.2.1 Thinking outside of one's own dominant industry logic: It can be hard to create new ideas, if the memory of the company's past success is blocking it. It can be even hard for open-minded leaders to break their dominant logic. The more we know the more we are stuck in existing patterns of thought. That is why the dominant industry logic gets called into question by new recruits because their minds are not set in the same way. They are able to come up with suggestions and questions others would may never think of. Some companies, such as Nestle, analyze these questions by recruiting newcomers with a different background of industry to have a source of new ideas. (Björkdahl and Holmén, 2013). It is important that leaders are getting out of their comfort zones, they may be stuck on their current business models, which is okay as long as it makes profit. But in case of a change they need to be flexible to introduce a new business model before it is too late.

2.2.2 The difficulty of thinking in terms of business models rather than of technologies and products: This challenge is one reason why business model innovation is such a rarity. While there is always new upcoming technology which serves as drivers of business models, it is more common for them to be generic in nature. The creative leap of technologies such as the internet or cloud computing lies in their use and application in one's own business that is how they can revolutionize it. A true revolution is the discovery of the potential viability of a new technology the right business model.

2.2.3 The lack of systematic tools: This challenge can facilitate creativity and divergent thinking. This is relevant for developing innovative business models.

IJARCCE

ISSN (Online) 2278-1021
ISSN (Print) 2319-5940

International Journal of Advanced Research in Computer and Communication Engineering

Vol. 9, Issue 2, February 2020

2.3 Business Model Canvas

The business model canvas is a popular way of generating or working on a business model. It can be used as a visual template for developing new or documenting existing business model. It is a visual chart of nine building blocks – key partners, key activities, key resources, value propositions, and customer relationships: customer segments, channels that deliver value proposition to its targeted customers cost structure and revenue stream. A business model is the way in which a company "creates, delivers and captures value" (Osterwalder and Pigneur, 2010), also, it describes the operating logic of a company. Those business models can be examined from a variety of perspectives, but the most established business model analysis and development framework is the business model canvas. The business model canvas was developed by Osterwalder and Pigneur (2010). It divides the business model of a company into nine building blocks, which in turn contain different elements that are called types. So, the business model can be analyzed by breaking it down into its elements – the nine building blocks and their associated types. Because the business model canvas is based on a meta-analysis of business model frameworks, most of the different types of model frameworks that exist are mostly end up using the same building blocks. In this study the business model canvas is also used as a theoretical framework.

To understand today's IoT business models, and how they will evolve, we need to recognize the point at which the value of an IoT deployment is realized. Also, there is no single canonical business model for the IoT, and implementers of IoT solutions will have to consider carefully where their product, service, or solution sits within the IoT value-chain. Furthermore, it is important to know how and where the consumers of the offering will derive value from it in order to determine the right business model for their proposition (Osterwalder and Pigneur, 2010).
How the business model canvas looks like is shown in the figure below

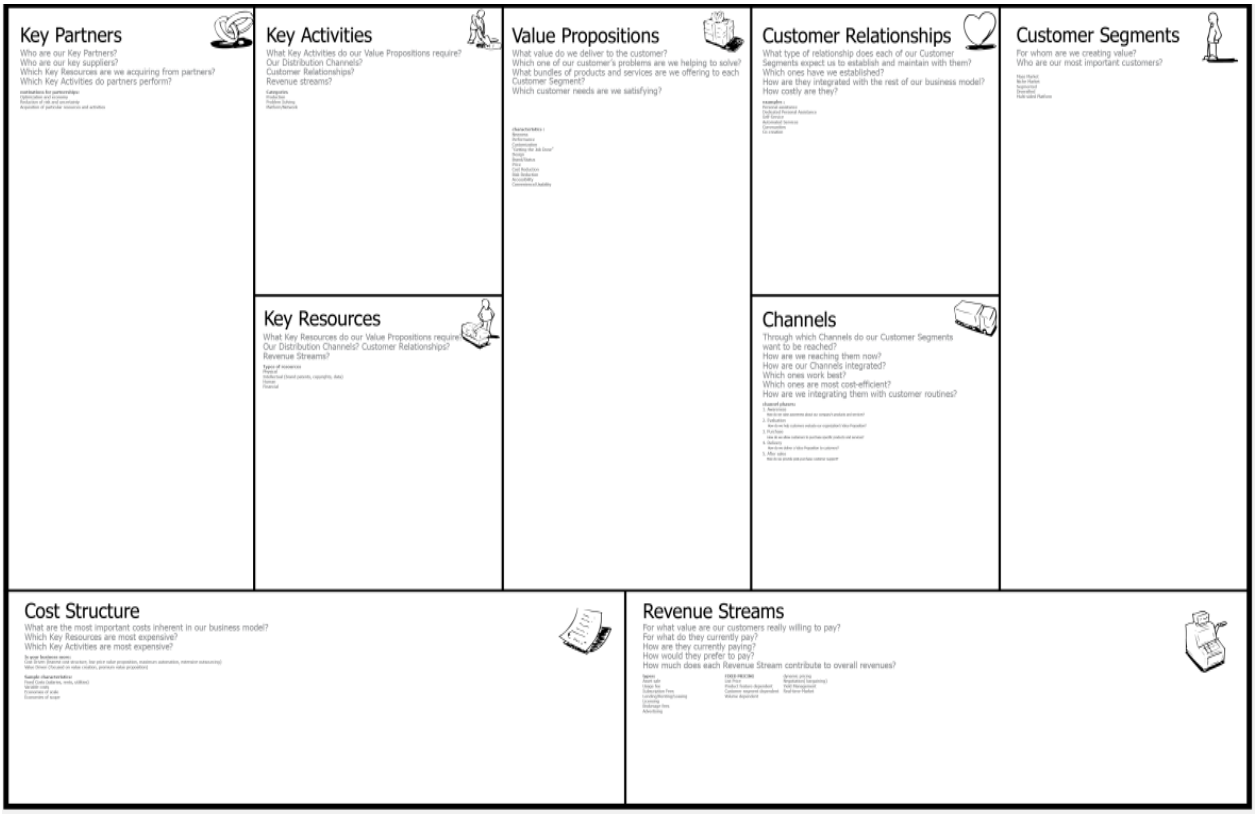

Fig. 2 Business ModelCanvas (own illustration)

2.4. The Business Model Navigator

With the Business Model Navigator, you can see how the concept of the business model design is understood and how you prepare yourself for thinking in business models. The Navigator serves as a Guide to help you to innovate your business model in a structured manner (Gassmann et al., 2014). The goal of it is to create an engineering methodology for business model innovation. The Business Model Navigator is an action-oriented methodology that permits any company to break with its dominant industry logic and innovate its business model. Below you can see a figure of the Business Model Navigator. It works in all manner of organizations, industries and companies.

IJARCCE

ISSN (Online) 2278-1021
ISSN (Print) 2319-5940

International Journal of Advanced Research in Computer and Communication Engineering

Vol. 9, Issue 2, February 2020

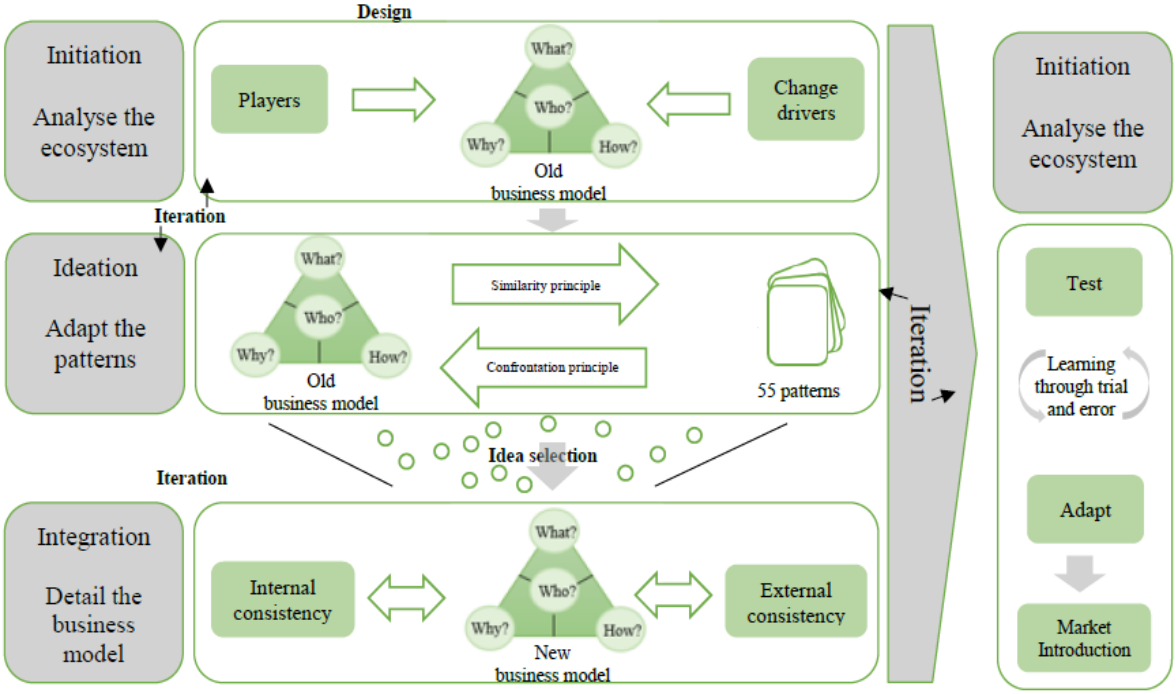

Fig. 3 Business Model Navigator (own illustration)

3. IIoT Business Model Navigator

In the following chapter, a Catalog of different Business Model patterns are going to be introduced. The chosen patterns work perfectly well for every prospective business model innovator. With the support of the business model patterns, it is easy to overcome mental barriers that may block the road towards new ideas. But every business model must be applied to one's own situation and thereby understood with regard to its overall meaning, the company's key success factors and peculiarities. So, it is not recommended to copy the patterns, it is important to understand the business model. The Business model patterns of the catalog don't have to be used in the same way as they are written down, for example the recombining of them may evolve different sights of your existing business model (Gassmann et al., 2014).

3.1 IIoT Business Model Patterns – Catalog

Table I: IIoT Business Model Patterns

Business Model components used in the Catalog:		
Digital Add-on	**Digital Lock-in**	**Cross-selling**
Freemium	**Self Service**	**Fractional Ownership**
Guaranteed Availability	**Pay per Use**	**Performance-based Contracting**

Digital Add-on: This is a business model component, where various digital services are offered in the after sales phase. In this business model, the customer is offered numerous extras that drive up the final price. In the end, the customers pay more than originally anticipated, but benefit from selecting options that meet their specific needs (Weinberger et al., 2016). This pattern generally required a very sophisticated pricing strategy. The core product must be effectively advertised and is often offered at very low rates. This business model pattern is especially well-suited for hard-to-segment markets, where customer preferences often diverge vastly. Simply dividing products into different levels or versions is insufficient, and no optimal value proposition can be guaranteed for a large number of customers.

Digital Lock-in: In this business model, customers are "locked-in" to a vendor's world of products and services in such way that changing to another provider would incur substantial costs or penalties (Weinberger et al., 2016). It

should be noted that in this context the term "costs" does not refer to monetary costs alone: the time needed to switch to a new option and learn how to use it may be just as relevant for customers (Gassmann et al., 2014).

Product as a Point of Sales (Cross-selling): Physical products can become platforms for digital sales and marketing services. An early version of this business model component that already exists today, is the option to access an internet shop when pointing with a smartphone on a specific product. With this, companies are allowed to advertise or cross-sell further offerings directly via the original product (Weinberger et al., 2016). This means that customers might collect loyalty points or search for user information applying any medium device, such as smartphones. Cross-selling promotes the offering of complementary products and services beyond a company's basic product and service range, with the aim of exploiting existing customer relationship to sell more goods (Gassmann et al., 2014).

Freemium: A physical good is sold, along with a free digital service (Weinberger et al., 2016). Examples here can be free digital maintenance or remote-control services. Such services enhance the value proposition of the product and might allow companies to sell the product at a premium. However, it is free for customers to use the basic service itself (Gassmann et al., 2014).

Self Service: Self Service describes a scenario where not humans, but machines reorder spare parts or required ingredients. An illustrative example could be heating system automatically re-ordering oil as soon as a pre-defined threshold in the oil tank is reached (Gassmann et al., 2014).

Fractional Ownership: In this Business Model pattern, customers purchase only a part of an asset rather than its entirety. Customers have to come up with only a fraction of the full price (Gassmann et al., 2014).

Guaranteed Availability: A different business model pattern is the guaranteed availability this assures access to your product. The meaning of this pattern speaks for itself (Weinberger et al., 2016).

Pay per Use: In this model, the specific usage of a service or product by the customer is metered and charged. It is employed within the consumer media market for televisions, online services and more, and attracts customers wishing to benefit from flexibility (Gassmann et al., 2014).

Performance-based Contracting: This pattern implies calculating the price of a product by considering the services it renders rather than its face value (Gassmann et al., 2014).

3.2 IIoT Reference Business Models - Catalog

The results of identifies contributions are assigned to the nine elements of the Business Model Canvas. The Business Models that have been found are categorized in three sections as you can see below.

Table II: Reference BM's

Reference Business Models used:		
Cloud-based BMs	**Service-oriented BMs**	**Process-oriented BMs**

3.2.1 Cloud-based Business Models

One model here is the so-called Infrastructure-as-a-Service (IaaS) that aim a providing required hardware and software online in the cloud. Customers do not need to possess the infrastructure necessary for their business on their own. But, Cloud-based BMs that are open towards external parties and provide development-oriented platforms facilitating the development of applications and the integration of applications into existing solutions are called Platform-as-a-Service (PaaS) model. Such platforms foster interactive knowledge transfer between developers by providing knowledge management tools. These Cloud-based-BMs may offer online capable and customized applications that are provided via the cloud. This refers to the Software-as-a-Service (SaaS) BMs. When it comes to the customer interface of Cloud-based BMs, literature differentiates between IaaS, PaaS, and SaaS models. IaaS offers its value primarily to start-ups and educational institutions, which both typically suffer from shortage of capital. PaaS and SaaS BMs both address independent software vendors as well as small and medium-sized enterprises. Value configuration and core competencies highly depend on the offered value proposition. Especially companies that are operating an IaaS or PaaS BM mainly have to develop and provide cloud services and applications and ensure the security of the service as well as the underlying data, service availability, and service reliability (Weber, 2014). The SaaS BM require the creation of applications that are compatible with most other systems and programs, and the establishment of a suitable partner network as key activities.

IJARCCE

ISSN (Online) 2278-1021
ISSN (Print) 2319-5940

International Journal of Advanced Research in Computer and Communication Engineering

Vol. 9, Issue 2, February 2020

Regarding the financial aspects of Cloud-based BMs, IaaS providers can realize reduced costs due to the aforementioned economies of scale. By using a SaaS, BM you have to consider initial costs for installation and services. The revenue model, a pay-per-use model characterizes the IaaS models, for example the customer only pays for utilized resources or time. In terms of the PaaS BM, providers generate revenues by both subscription fees and transaction-based income models. Sales channel focused platform, advertisements are another suitable way to generate revenues. It service like bandwidth, CPU computation time, and data storage serve as another income source. SaaS models, revenues are generated by usage-based fees, which consider the real resource consumption.

Illustration of the Could-based BM (BMC)

Table III: Cloud-based Business Model

<table>
<tr><th>Partner network</th><th>Value configuration</th><th>Value proposition</th><th>Relationships</th><th>Target customers</th></tr>
<tr><td rowspan="3">- Risk reduction
- Synergies due to economies of scale
- Shared usage of resources</td><td>- Development of cloud services and applications
- Establishment of partner network</td><td rowspan="3">- Processing power
- Data storage
- Virtualization of the operating system
- Development-oriented platforms
- Integration of applications
- Applications</td><td>- Community networks
- Forums</td><td rowspan="3">- Educational institutions
- Startups
- Independent software vendors
- Small and medium-sized enterprises</td></tr>
<tr><td>Core competencies</td><td>Distribution channels</td></tr>
<tr><td>- IT resources
- Software infrastructure
- Knowhow</td><td>- On demand</td></tr>
<tr><td colspan="3">Cost structure</td><td colspan="2">Revenue model</td></tr>
<tr><td colspan="3">- Cost reduction
- Initial costs for installation
- Service costs</td><td colspan="2">- Pay-per-use
- Subscription fees
- Advertisement</td></tr>
</table>

3.2.2 Service-oriented Business Models

This type of business models offers utilization, analysis, and aggregation of data (Bulger et al., 2014). An example here is the medical environment, a platform can help doctors to access patients' medical records, therapies, and prescriptions in real-time. It also offers data mining and analysis solutions. The value proposition is offered to a mass market on demand through infrastructures and platforms, which are established by Cloud-based BMs, as well as the own company's website. Service-oriented BMs usually provide a self-service interface and automated services to customers. For the value configuration, the maintenance and further development of platforms, infrastructures, and applications are the most important activities. The platforms and the required infrastructure represent crucial resources; they include methods of data analysis, communities generating data, as well as data themselves. Also, employees are capable of handling big data and data analysis that are crucial. In the partner networks, the community plays a crucial role. To gather the required data, crowd-sourced information is necessary, those can be ratings of local enterprises or health information of patients (Muhtaroglu et al., 2013). Furthermore, infrastructure and platform developing companies are important partners. Service-oriented BMs associates with initial costs for establishing facilities like datacenters. Most of the costs are of variable nature since costs for required infrastructure correlate with the amount of data to be gathered and analyzed. The revenue model identifies the collected data, which can be utilized to offer novel services. That is possible with direct monetization, where data is collected by a product and directly utilized, or an indirect monetization, where data generate novel insights that can be addressed by future offerings (McKinsey Digital, 2015).

IJARCCE

ISSN (Online) 2278-1021
ISSN (Print) 2319-5940

International Journal of Advanced Research in Computer and Communication Engineering

Vol. 9, Issue 2, February 2020

Illustration of the Service-based BM (BMC)

Table IV: Service-based Business Model

<table>
<tr><td>Partner network
- Community
- Infrastructure providers
- Platform developers</td><td>Value configuration
- Maintenance and further development of platforms, infrastructures, and applications
Core competencies
- Platforms
- Data analysis methods
- Data
- Knowhow</td><td>Value proposition
- Utilization, analysis and aggregation of data</td><td>Relationships
- Self-service interface
- Automated services
Distribution channels
- Platforms
- On demand</td><td>Target customers
- Mass market</td></tr>
<tr><td colspan="3">Cost structure
- Initial establishment costs
- Variable instead of fixed costs</td><td colspan="2">Revenue model
- Collected data
- Direct and indirect monetization of data</td></tr>
</table>

3.2.3 Process-oriented Business Models

Those Business models offer the value of representing by process optimization resulting in reduced downtimes and increased machines availability (Kaufmann, 2015). Many different customers, but also primarily companies in the machine and plant engineering industry can benefit from those values. Data analyzation by Service-based BMs represent a crucial resource, to optimize processes within a company and across company boarders. That is why a platform is required to gather these data. Also, 3D printers are not negligible since they enable their customers to print spare parts, with this result in reduced downtimes due to the eliminated delivery times. The respective companies have both a master complex production processes and various production technologies as well as possess the associated knowhow. Revenues can be generated by licenses for the interface between the machine and plant engineering company and its customer or for technology applications (Kaufmann, 2015). In addition to that, higher prices are a possibility for rapidly available spare parts since downtimes and therefore sales shortfalls can be reduced. For this BM type are no detailed descriptions for all nine Business model elements available, so not all statements could be identified in the following illustration of the Business Model type.

IJARCCE

ISSN (Online) 2278-1021
ISSN (Print) 2319-5940

International Journal of Advanced Research in Computer and Communication Engineering

Vol. 9, Issue 2, February 2020

Illustration of the Process-based BM (BMC)

Table V: Process-based BM

<table>
<tr><td>Partner network</td><td>Value configuration</td><td>Value proposition</td><td>Relationships</td><td>Target customers</td></tr>
<tr><td>-</td><td>- Master complex production processes and various production technologies</td><td rowspan="3">- Reduced downtimes
- Increased machine availability</td><td>-</td><td rowspan="3">- Machine and plant engineering industry</td></tr>
<tr><td></td><td>Core competencies</td><td>Distribution channels</td></tr>
<tr><td></td><td>- Platforms
- Data
- 3D printers
- Knowhow</td><td>-</td></tr>
<tr><td colspan="3">Cost structure</td><td colspan="2">Revenue model</td></tr>
<tr><td colspan="3">- Initial establishment costs</td><td colspan="2">- Licenses
- Higher prices possible</td></tr>
</table>

IV. CONCLUSIONS AND FUTURE WORK

This paper presents an analyzed research that leads to a framework for business models for the industrial Internet of Things. The research approach used a literature study, the creation of an IIoT Business Model Framework and a demonstration of it, it has been established how the Framework is useful in for the IIoT to create a suitable business model. Creating smart factories using the IIoT is a new trend that will undoubtedly grow in the coming years. Changes resulting from this phenomenon will contribute not only to the growth of manufacturing automation but will also evolve all other different areas that are related to the IIoT. The traditional companies will have to transition of those companies into the digital market. In order to provide the highest value proposition, manufacturers will be forced to redesign their products and changing existing business models. After introducing the problem statements and the background about the Internet of Things and the industrial Internet of Things, we dived into already existing literature, that show how different Frameworks, such as the Business Model Canvas and the Business Model Navigator works. The process and their core desires have been shown and what they are bringing with them. With the analysis of already existing literature, it showed that there is no concept of a business model that comprehensively supportive of the company passing on the digital market. Therefore, it is recommended to use a combination of different existing concepts and patterns for this. With the IIoT Business Model Framework the project contributes by filling the literature gap regarding IIoT business models and can serve as starting point of future research on IIoT business models. It is the first study that extensively shows which business model components are most important and relevant for the IIoT context and shows off how they are going to be used. Because the IoT and IIoT are relatively new phenomenon, and there is room for further research in this field. Future research could focus on a more detailed version of the Framework to use, so the Framework could be expanded to more process-steps or different sections and areas that could be covered as well.

Furthermore, further research can be done on the IIoT business models, and future research could focus on different fields of the IIoT, e.g. health care or many more areas. Also, the IIoT business model components can be studied through both qualitative and quantitative methods and the resulting findings of this paper can be compared with existing literature to discover similarities and differences between the business models of different kinds of areas in the IoT and IIoT. Further research for other possible business model components and patterns can be conducted to expand the range of the IIoT BM Framework Catalog. The transition from a traditional business model to a PaaS model warrants further research, as the benefits of PaaS are most likely interesting for many companies. Research into this field could not only illustrate the benefits and challenges that are related to PaaS, but also the steps that are needed for making this transition.

REFERENCES

[1]. M. De Saulles, "The Internet of Things and Business". pp. 2-3, 2016.
[2]. E. Gasiorowski-Denis, (2016, Sep. 5) How the Internet of Things will change our lives. Online Available: https://www.iso.org/news/2016/09/Ref2112.html.
[3]. M. Burgess, (2018, Feb. 16) What is the Internet of Things? Wired explains. Online Available: https://www.wired.co.uk/article/internet-of-things-what-is-explained-iot.
[4]. A. Gilchrist, "Industry 4.0: The Industrial Internet of Things". pp. 3-5, 2016.
[5]. CTI Group (2016, Sept.) IoT vs. IIoT. Online Available: https://www.computradetech.com/blog/iot-vs-iiot/
[6]. D. Serpanos, M. Wolf, "Internet-of-Things (IoT) System: Architectures, Algorithms, Methodologies". pp. 41, 2017.
[7]. B. Chan, (2017, Dec. 14) IoT vs. Industrial IoT: 10 Differences that matter. Online Available: https://www.iotforall.com/iot-vs-industrial-iot-differences-that-matter/.
[8]. Emerald Group Publishing, "Business Models and Modelling". pp. 221-222, 2015.
[9]. O. Gassmann, K. Frankenberger, M. Csik, The Business Model Navigator ". pp. 13, 2014.
[10]. J. Björkdahl, M. Holmén, Business model innovation-the challenges ahead Online Available: https://www.researchgate.net/publication/243458937_Business_model_innovation_the_challenges_ahead.
[11]. A. Osterwalder, Y. Pigneur, "Business Model Generation: Ein Handbuch für Visionäre, Spielveränderer und Herausforderer", pp.21-48, 2010.
[12]. M. Weinberger, D. Bilgeri, E. Fleisch, IoT business models in an industrial context Online Available: https://www.researchgate.net/publication/308130091_IoT_business_ models_in_an_industrial_context
[13]. Muhtaroglu FCP, Demir S, Obali M and Girgin C (2013) Business model canvas perspective on big data applications. In: IEEE International Conference on Big Data, Silicon Valley, CA.
[14]. James Manyika, Michael Chui, Peter Bisson, Jonathan Woetzel, Richard Dobbs, Jacques Bughin, and Dan Aharon, " Unlocking the potential of the Internet of Things"Online Available: https://www.mckinsey.com/business-functions/digital-mckinsey/our-insights/the-internet-of-things-the-value-of-digitizing-the-physical-world 1/4 Report June 2015 McKins ey Global Institute
[15]. B.E. Kaufman, "Evalution of strategic HRM as seen through two founding books: A 30th anniversary perspective on development of the field", Human Resource Management, vol. 54, no. 3, pp. 389-407, 2015.